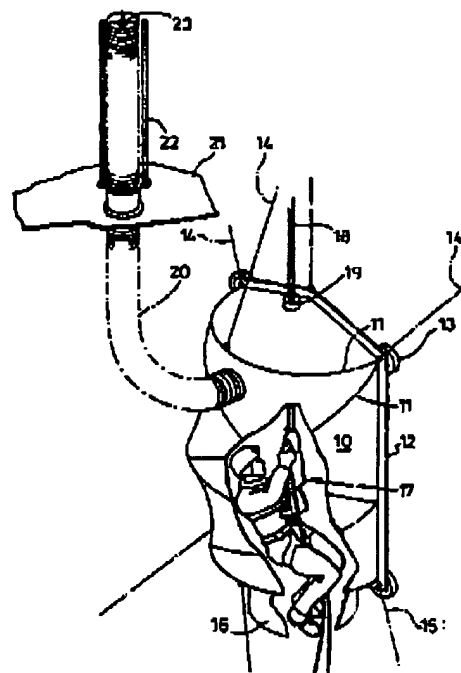


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US 4631872 A US 4581988 A****(58) Field of Search****UK CL (Edition O) E1D, F4V VF8, VFYD VGAB VGAC****INT CL<sup>6</sup> E04H 9/00 9/04 9/12 9/15 15/22, F24F 3/16  
9/00****Online: WPI****(54) A working enclosure**

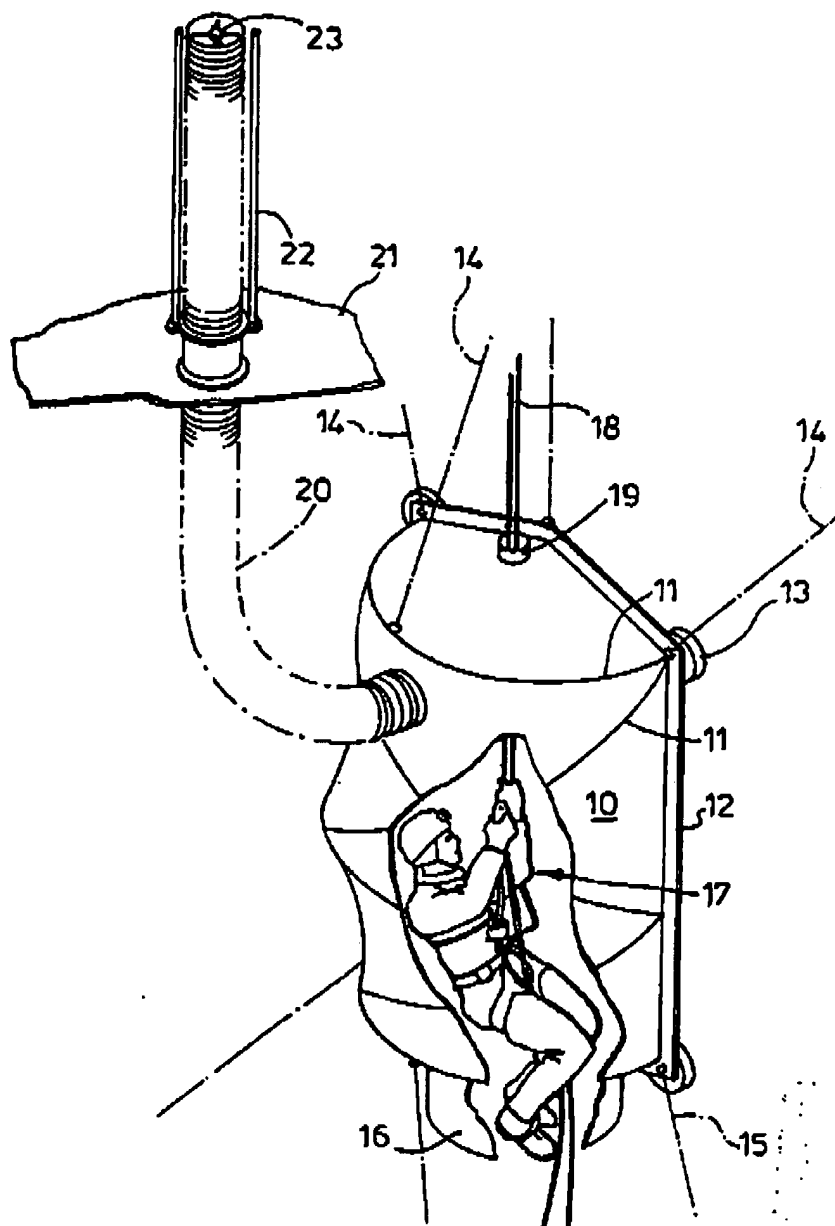
(57) A working enclosure adapted to provide a clean air zone within a potentially hazardous environment such as an oil storage tank, the enclosure comprising a canopy (10) supported by a frame (11) and having a skirt (12) to be held in close proximity with the tank wall by magnetic pads (13). The canopy (10) is supported in a vertical attitude by rigging ropes (14) and steady ropes (15). An operator may enter and leave the canopy via a sealed flap (16), and a supply of clean air from a fan (23) is supplied to the interior of the canopy by a duct (20). In the clean air zone created by the enclosure an operator on suspension lines (18) may carry out "hot work" on the tank wall while the supply of clean air is monitored, and an alarm sounded or the operation shut down automatically in the event of air contamination.

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 26(1) of the Patents Rules 1995

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**A WORKING ENCLOSURE**

**THIS INVENTION** concerns a working enclosure adapted to provide a clean air zone within a potentially hazardous environment.

The invention is particularly though not exclusively concerned with the provision of a clean air zone in the form of a habitat within which so-called "hot work" may be carried out. Hot work may be deemed to be any activity which has the potential to introduce a source of ignition into a zone which may contain a gas and air mixture within a flammable range. The lower limit of such a range may be defined as the concentration below which there is insufficient flammable gas to support combustion and the upper limit may be the concentration above which there is insufficient air to support combustion. Such work is often carried out in vessels adapted to contain gas or flammable liquids such as the oil storage tanks of crude oil carriers. It is sometimes necessary, to carry out, when such vessels are empty, repair work on parts of the internal structure. This work may involve welding or cutting, and residues of gas and oil can cause an explosion when a source of ignition is introduced into such a potentially hazardous environment.

According to the present invention, there is provided a working enclosure adapted to provide a clean air zone within a potentially hazardous environment, the enclosure comprising a canopy adapted to cover at least a part of a working surface to define therewith a clean air zone, at least one duct connecting said zone to

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a supply of clean air, means to monitor the content of the air supplied to said zone, and alarm/shut down means responsive to the monitoring means.

The term "clean air" is to be construed as including either fresh clean air which is free of acutely inflammable gases, or for example, a mixture of clean air and an inert gas.

The canopy may be provided in the form of a flexible shroud or a rigid enclosure or bubble.

Preferably, the canopy also includes means for operator access to the interior thereof and means whereby the edges of the canopy may be maintained in close relationship with the working surface.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawing which, in perspective, illustrates a working enclosure made in accordance with the invention and occupied by an operator in readiness to carry out work on a vertical surface within, for example, an emptied oil tank.

The canopy 10 made from, for example, a durable material such as nylon, pre-treated or lined with a fire prevention substance or blanket, is supported by a frame 11 and has a peripheral skirt 12 adapted to locate closely against a working surface to which

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the device may be applied and retained by magnetic pads 13. The canopy is preferably supported from above by rigging ropes 14 and at the bottom by steady ropes 15. A sealable access flap 16 is provided at the base of the enclosure through which an operator 17 may enter and leave the enclosure. One or more suspension lines 18 to support the operator, pass into the canopy 10 through a generally sealed aperture 19 at the top of the canopy. Thus the enclosure is located temporarily in a fixed position against the working surface and in substantially sealed engagement therewith by means of the skirt 12, the flap 16 and the aperture 19.

A duct 20 is connected to the canopy wall and communicates with the interior of the enclosure. The duct is preferably made from a flexible material and passes upwardly out of the hazardous environment, for example, through an aperture in a decking panel 21 and is supported above same by a frame 22 at the upper open end of which there is provided a fan 23 supplying air through the duct 20 into the enclosure. The fan 23 is associated with a sensing or monitoring device (not shown) which is further associated with an adjacent or remote alarm/shut down system for a purpose to be described.

Within an enclosure as described the operator may carry out welding, cutting or similar operations without the risk of causing an explosion since clean air is ducted into the enclosure at a slight over-pressure thus bleeding from the flap 16 and aperture 19, and around the skirt 12.

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The upstanding frame 22 ensures that the fan supplying clean air is disposed well above the deck 21 to be well above any low-lying gases which may be present.

The sensing or monitoring device associated with the fan 23 is adapted to detect the presence of a toxic or inflammable contaminant in the air being supplied to the enclosure, and if present will either sound an alarm to alert the operator or other staff thus to discontinue the hot work, or to shut down the supply of power to whatever hot work tools are being used in the enclosure, or again simply to shut down the fan supplying the contaminated air to the duct 20.

When the working surface upon which the hot work is being carried out is located between two potentially hazardous zones, for example, when repairing a bulkhead separating two hydro-carbon storage tanks, a second enclosure similar to that described may be positioned on the opposite side of the bulkhead whereat local heating of the working surface may otherwise create an explosive condition.

It is not intended to limit the invention to the above details. For example, the canopy 10 may be produced in the form of a rigid pre-shaped enclosure, and the access flap 16 may be omitted in an application where the canopy is to be disposed over a horizontal surface and lowered into place with an operator already in position. Indeed, the form of the enclosure may differ in many respects depending upon the application and location of the work to be carried out.

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**CLAIMS**

1. A working enclosure adapted to provide a clean air zone within a potentially hazardous environment, the enclosure comprising a canopy adapted to cover at least a part of a working surface to define therewith a clean air zone, at least one duct connecting said zone to a supply of clean air, means to monitor the content of the air supplied to said zone, and alarm/shut down means responsive to the monitoring means.
2. A working enclosure according to Claim 1, wherein the canopy is in the form of a flexible shroud supported by a frame and having a peripheral skirt adapted to locate closely against the working surface.
3. A working enclosure according to Claim 1 or Claim 2, wherein the canopy includes an access opening through which an operator may enter or leave the enclosure, the opening being sealable to maintain the clean air zone within the canopy.
4. A working enclosure according to any preceding claim, wherein the canopy has a non-flammable internal surface.
5. A working enclosure according to any preceding claim, wherein the canopy is disposed upright, supported from above by rigging ropes and from beneath by steady ropes.

